

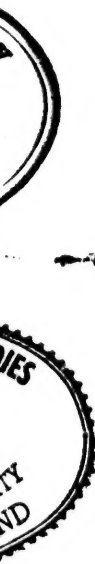
REPORT
ON
PROPOSED
GRAVING DOCK
AND
HARBOUR IMPROVEMENTS,
AT
ST. JOHN'S, NEWFOUNDLAND,

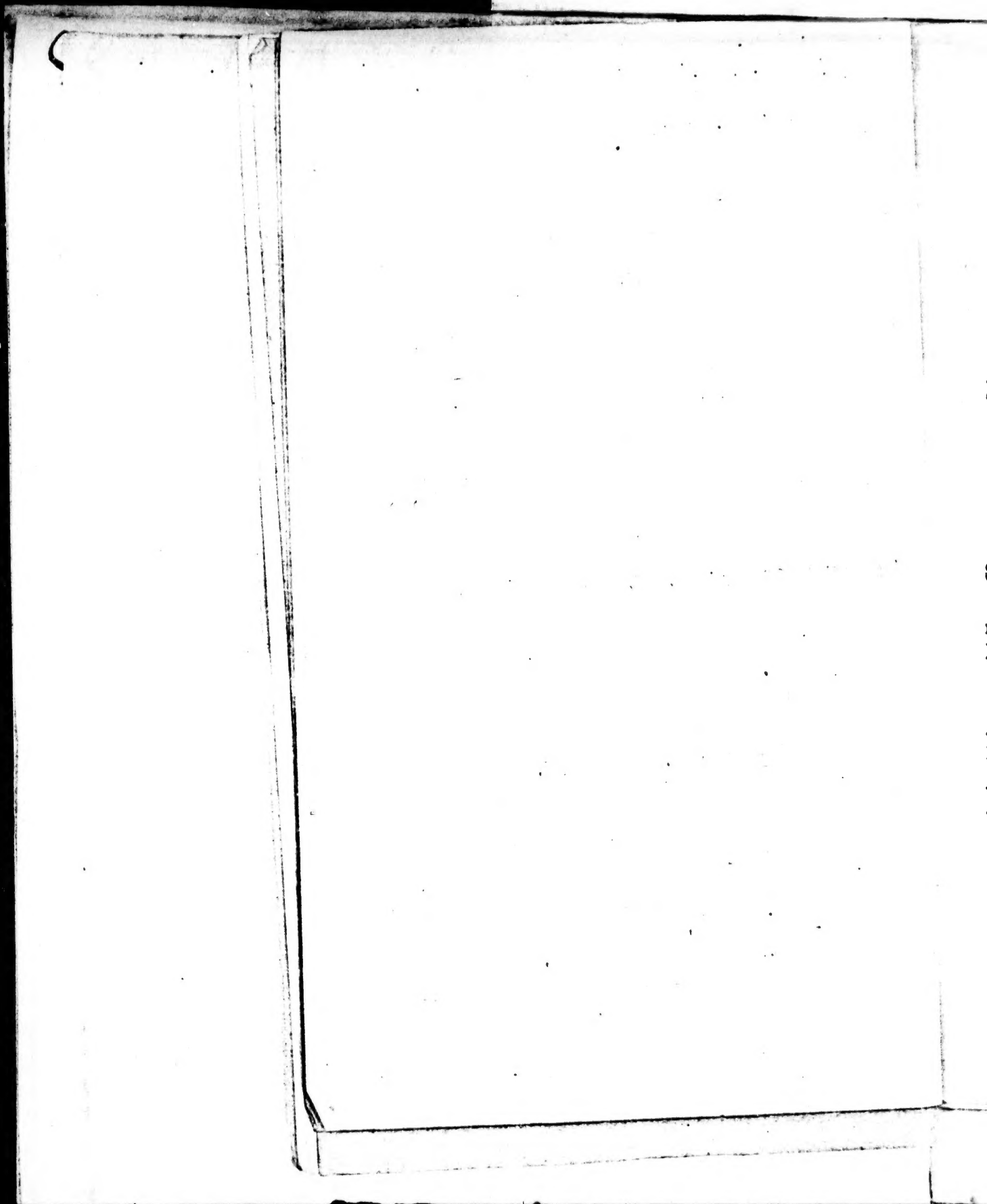
BY
MESSRS. KIMPPLE & MORRIS,
ENGINEERS,
LONDON & GREENOCK.


ST. JOHN'S, NFLD.:
J. C. WITHERS, QUEEN'S PRINTER,
1878.

From
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3, Westminster Chambers, S. W., London, }
and Greenock, N. B., 13th Sept., 1878. }

*To His Excellency Sir John Glover, G. C. M. G.,
Governor of Newfoundland.*

HARBOUR IMPROVEMENTS,

RE PROPOSED GRAVING DOCK, &c., IN ST. JOHN'S
HARBOUR.

SIR,—

We have the honor to submit, for your information, the following Report on the proposed Graving Dock and Harbor Improvements at St. John's.

SITE.

The site for the Graving Dock, proposed by Your Excellency, immediately to the East of, or below Job's Bridge, at "River Head," is more or less dry at low water, and at the present time is only occupied by temporary fish stagings.

Our Mr. MORRIS examined this site on several occasions, and we have little hesitation in saying that no better site on which to construct a Graving Dock can be found in the Harbor of St. John's: in fact, there is no other site suitable for such a purpose. It is situated at the head of the Harbor, is out of the

way of general traffic, and its entrance points down the Harbor along an excellent fair line of entry. This Dock, situated as laid down with its line of entry, would necessitate the removal of a small portion of the long wharf belonging, we believe, to Mr. TESSIER; but this small disadvantage would be amply balanced by the large area of land reclaimed adjoining the Dock, shewn on plan, a portion of which might be transferred to Mr. TESSIER as compensation for any loss sustained in consequence of the New Dock Works.

BORINGS.

From the Report of Staff Commander ROBINSON, R. N., on the result of the borings made under his supervision, on the site at "River Head," we observe that the solid rock in the vicinity of the site for the Entrance Works of the proposed Dock was reached at a level of about 29 feet 9 inches below High Water Mark, and from this point the rock rises gradually towards the spot where the Head of the Dock would be founded.

The fact of the rock lying at such depths we regard as most fortunate, as it permits of the whole of the Works being substantially and solidly founded without resorting to expensive artificial foundations, which is a matter of immense importance in a work of this character.

CLASS OF DOCK.

We believe there cannot be two opinions that a permanent Stone Dock, with Wrought Iron Sliding

Caisson and the usual Pumping Machinery, is the most suitable for St. John's. The whole of the Works we propose should be equal in character to those in connection with the Docks now being constructed under our superintendence at Quebec, in British Columbia, on the Thames, and at Greenock.

There are one or two points which perhaps might be desirable to bring under Your Excellency's notice, shewing the advantages of a permanent Stone Dock over a Wrought Iron Floating Dock. In the case of a Wrought Iron Floating Dock the money necessary for its construction would be expended out of the Island, whereas for a Stone Dock, the money required for its construction would be expended in St. John's, and be the means of employing a large amount of labor for some three or four years. Again, the original cost of a Floating Dock would be no less than that of a permanent Stone Dock of equal working capacity. In the matter of maintenance of a Floating Dock, the cost of repairs, painting, &c., is a very serious item, and a very considerable sum per annum would have to be added for depreciation, whereas a Stone Dock, when built, is a permanent work, and would, with little or no outlay for repairs, last for centuries. It is very notable that in all Government Establishments, from the earliest times down to the present, Graving Docks have been invariably, or almost entirely built of stone, and we only know of one instance of the Government building a Wrought Iron Floating Dock, viz., at Bermuda.

The range of tide at St. John's is small (about 5 to 6 feet) and consequently would involve, in the case of a Stone Dock, the pumping out of nearly the whole of the water admitted at each docking operation; but this would not increase the cost of the Pumping Machinery, but would simply add to the cost of fuel and time of pumping out. At Greenock, although there is a range of tide of about ten feet at spring tides, it has been the practice for years, and is found to be more economical, to commence to pump out the water from the Dock immediately after the Ships have entered, than to wait five or six hours for Low Water before commencing pumping operations; the advantage being that ships entering the Dock are placed on blocks and shored within an hour, whereas if the men have to wait for the lowering of the tide and the grounding of the vessels on to the blocks, they are necessarily detained many hours. With a low range of tide it is possible to dock a vessel any hour of the day, and for small vessels no doubt docking operations at St. John's would always be at about Low Water time, which would considerably reduce the cost of pumping.

DESCRIPTION OF DOCK.

The side walls would be faced with ashlar, either of the red sandstone or blue stone obtained from the District of St. John's, backed with Portland Cement Concrete, likewise the upper or shoring altars; the coping stones and stones for the stop quoins and inverts for the Caisson to set against will be of granite,

obtained from some of the Western Bays of the Island.

The bottom of the Dock to be of Portland Cement Concrete, and the surface of floor or bottom to be of stone paving. The Pumping Engines, Boilers, and other Machinery, would be of the latest and most improved character.

GENERAL DIMENSIONS OF DOCK.

	Maximum Size of Dock, or same as at Quebec.	Minimum for a Commercial Dock com- plete.
Clear length on floor of Dock	500 ft.	500 ft.
Top, inside width of Dock at coping level	100 ft.	80 ft.
Width of bottom of Dock ...	83 ft.	63 ft.
Width of Main Entrance at coping level	66 ft.	60 ft.
Depth from High Water, O.S.T. to cill of Main Invert	25 ft. 6 in.	22 ft.
Depth from High Water, O.S.T., to floor of Dock at Main Invert	27 ft.	23 ft. 6 in.

By reference to the plan it will be seen that a Dock of 500 feet clear length on floor, can be constructed with the necessary entrance, wing walls, and other works, without interfering in any way with Job's Bridge, or the approach leading thereto.

COST OF DOCK.

We estimate the cost of the Docks of the dimensions above described—inclusive of Pumping Machi-

nery, Wrought Iron Caisson—and dredging of the approach to the Dock, to be as follows:—

For the Maximum size of Dock 500 feet in length, having the proposed depth of 25 feet 6 ins. of water on Cill at High Water, Ordinary Spring Tides, or of the same dimensions as the Dock now building at Quebec £103,500

For a Dock similar to the above in every respect, with the exception of the length, which is to be 250 feet instead of 500 feet £68,307

For the smaller or commercial size of Dock, which it is proposed will have only a depth of 22 feet on Cill at High Water, Ordinary Spring Tides, instead of 25 feet 6 ins., and a width of 80 feet at coping level instead of 100 feet, if of the full length of 500 feet, £80,727

For a Dock similar to the above in every respect, with the exception of the length, which is to be 250 feet instead of 500 feet £60,112

In the foregoing estimate of the cost of a Short Dock we have included the cost of providing sufficient Pumping Power to remove the whole of the water from the Dock, when constructed of its full length of 500 feet.

**COST OF RECLAMATION OF FORE-SHORE BETWEEN
GAS WORKS AND JOB'S BRIDGE.**

By reference to the plan it will be observed that we have shewn to the Northward a promenade 30 ft. wide which would be formed of the materials obtained in dredging out an approach or channelway to the Graving Dock; this portion of the reclamation scheme as regards cost is included in the estimate of the proposed Dock, therefore all we have to consider is the extra cost of filling up the space between the existing promenade and the proposed promenade referred to, and the cost of the stone pitching necessary to protect the outer slope of this work next the river.

We find that it will take about 100,000 cubic yards of materials to fill up the space between the two promenades; supposing the whole of this quantity to be obtained from the hills on the opposite side of the river, it would probably cost from £5,000 to £8,000 stg., but we think that a large portion of this area might, to a great extent, be filled up from time to time by town refuse or used as a place of deposit for the dredged materials now being obtained from between the wharves; but should this area of ground be laid out for Warehouses with Cellars, probably not more than about one half or 50,000 cubic yards would be required for filling. Under these circumstances, and pending the final determination as to what purpose this reclaimed land is to be put to, we think it will be ample to allow £5,000 as the cost for the filling, and adding for the cost of the stone pitch-

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ing another £500, making altogether £5,500 as about the probable cost of reclaiming this area of land of nearly 10 acres in extent. It will be noticed that if the Dock Works be carried out, the cost of enclosing the area of the proposed promenade of 30 feet in width, and forming the pitched or stone slope, will only cost about £500 by reason of the materials for forming the promenade, as before-mentioned, being obtained from the dredging of the proposed channel-way to the Dock.

**COST OF GRAVING DOCK AND RECLAMATION OF SOUND
BETWEEN JOB'S BRIDGE AND THE GAS WORKS.**

1st. We find the cost of reclaiming land between the existing and the proposed promenade, as shewn on plan, and between the Gas Works and Job's Bridge, will amount to, say	£5,500
Cost of larger Graving Dock for the full length of 500 feet	103,500
Total	£109,000
Or, say ...	£110,000 stg.
2nd. Cost of Reclamation, say	£5,500
Cost of larger size Dock, but of only half the length, or 250 feet ...	68,307
Total	£73,807
Or, say... ..	£75,000

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3rd. Cost of Reclamation, say	£5,500
Cost of smaller or Commercial Dock, 80 feet wide, 500 feet long	80,727
Total	£86,127
Or, say	£87,000
4th. Cost of Reclamation, say	£5,500
Cost of smaller or Commercial Dock 80 feet wide, 250 feet long	60,112
Total	£65,612
Or, say	£66,000

SOURCE OF REVENUE OF DOCK.

From information obtained by our Mr. MORRIS, when recently in St. John's, we understand there are at least twenty-five to thirty steamers which go from St. John's and other ports in Newfoundland to Sydney, annually, to be repaired, of a gross tonnage of about 9,000 tons.

The average cost attending each steamer, going to Sydney and back, in wages, insurance, coals, &c., the cost of Docking, and, after making allowance for a return freight of coals, amounts to fully £250 stg., and should the insurance run into a second month, the cost would amount to over £300 stg.

It will be admitted that there would be immense advantages to Shipowners in having their vessels docked and repaired immediately under their own

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supervision at St. John's, rather than suffer the inconvenience and annoyance of having to send their vessels to Sydney for repairs ; therefore, although the actual Dock charges would, for the use of the proposed Dock, be greater at St. John's than the Dock charges at Sydney, yet not so great as the cost of sending vessels to be docked at the latter place, and the tariff charged at St. John's might be such as to leave a money saving out of the before-mentioned sum of £250 stg., which it now costs for steamers to go to Sydney.

There are other collateral advantages in favor of Shipowners docking their vessels at St. John's, and we can readily understand that, in many instances, Shipowners would be very glad to incur a somewhat larger outlay than at present for the convenience and satisfaction of having their vessels docked and repaired under their own control and supervision at St. John's.

By taking the foregoing data as our basis of calculation, and assuming that only twenty-five or the smaller number of steamers would go into the proposed Graving Dock at St. John's ; and further, that it now costs £250 for each vessel to go to Sydney to be docked, and that the Shipowners are willing to pay £200 out of the £250 for each vessel docked at St. John's, there would at once be a revenue of 25 times £200 or £5,000 gross income from vessels belonging alone to St. John's and other ports in Newfoundland ; and to this should be added dues from

merchant vessels that might get disabled at sea and find it convenient to run for St. John's, and probably some of Her Majesty's Ships might occasionally make use of the Dock.

With this revenue, which, we are informed, may be relied upon, and with the chances of dues from foreign and other vessels, less the cost of working expenses, of say £750, hereinafter described, we consider there will be ample income to pay a good dividend on the total cost of the Works, as shewn by the following statement:—

Dock dues on twenty-five steamers ...	£5,000
Dock dues on foreign and other vessels, say	500
	£5,500
Less working expenses	750
Net revenue to Dock	£4,750

or over $4\frac{1}{2}$ per cent. on £103,500, the cost of the larger sized Dock of the full length of 500 feet, or nearly 6 per cent. on £80,727, the estimated cost of the smaller or Commercial sized Dock.

The reclamation of the land between the Gas Works and Job's Bridge we include as part of the Harbor Improvements; and not only would it form an excellent place for deposit of the excavated material, but would, in a very short time, become valuable building land, and certainly produce an income more than sufficient to cover any deficiency in Dock dues in consequence of any bad fishing seasons.

The area of land proposed to be reclaimed amounts to nearly 10 acres; and we are informed by competent authorities that its value, when reclaimed, would be from £40,000 to £50,000 sterling. Taking, say 5 per cent. on the lower estimated value, and there would be a rental of £2,000 per annum.

If the estimated cost of the construction of the larger Dock of the full length of 500 feet, and of the reclamation of the 10 acres of land above Job's Bridge, be taken at £110,000

Then we have a net revenue from the Dock of £4,750
And from the reclaimed land a net rental of £2,000 2,000

Or a total of £6,750 stg.,
or a little over 6 per cent. on the total cost of the Harbor Improvements.

If the estimated cost of the smaller or Commercial Dock of 500 feet in length, and the reclamation of the land above Job's Bridge, be taken at £87,000
and the same revenue of £6,750, then we have a return of rather more than $7\frac{3}{4}$ per cent. on an expenditure of £87,000.

We have not thought it necessary to carry our calculations further, so as to embrace the return likely to be derived should one or the other of the

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Docks be constructed of only half the full length ; for
owing to the cost of the entrance Works, Pumping
Machinery, and Caisson, the most expensive half
would be constructed first, and the interest would be
proportionately less, for by constructing only 250 feet
in length at first, instead of 500 feet, the working
capacity would be reduced by one half, but it would
not reduce the cost in a corresponding ratio, for,
on reference to the foregoing estimates, it will be
seen that the cost of constructing the lower half of a
Dock is about two-thirds of the whole.

Should the Harbor Improvements be undertaken
by the Government of Newfoundland, (though we
have no authority for thinking or suggesting this,)
probably the Government might be satisfied with a
net return of $3\frac{1}{2}$ or 4 per cent. on the outlay for the
Works, &c., the excess of income, or a portion there-
of, might be allowed to accumulate so as ultimately
to clear off the Government debt, or at all events to
such an extent, that the annual charge for interest
would become a mere nominal rent or charge on the
Dock, and thus enable vessels to be docked at rates
as low or even lower than those usual for docking on
the Clyde and the Thames.

WORKING EXPENSES.

In illustration of the cost of working a Dock,
such as that we have proposed for St. John's, we may
mention that at the Garvel Graving Dock at Greenock
which is 650 feet long by 80 feet broad at coping
level, with 21 feet of water on bottom, only two men,

an Engineer and Stoker, are permanently employed for working the whole of the Machinery, in connection with the Pumps, Capstans, and Opening and Closing Machinery of the Sliding Gate or Caisson.

This Dock, from High Water level down to the bottom, is pumped out in 3 hours, and $2\frac{1}{4}$ tons of coal are consumed; to these items would have to be added a sum for oil, waste, and for any small repairs.

CENTRE ENTRANCE OR DOCK DIVIDED.

Looking to the cost of pumping out the water from the Dock, the question might be asked, why not have an Entrance half-way along the body of the Dock? that is, the Dock divided into two lengths by a Caisson, to be closed when only a small vessel has to be docked.

The objection to this arrangement is—1st, That the cost of the second Entrance with its Caisson and works in connection therewith, complete; would be very large; 2nd, It would involve a loss of about 30 per cent. of the working capabilities of the Dock, for with a Centre Entrance ships could not be angled, and it would frequently occur that the Dock would only accommodate one vessel, whereas without the second or Centre Entrance, two very long vessels could be accommodated by angling or allowing the head of one vessel to overlap the stern of the other. Further, the Entries of ships for docking are generally more than the Dock can accommodate, and it would only occur when the last ship on the list of

Entries had to be docked that the full cost of pumping out the Dock would go against the charge of docking one vessel.

In most cases, by judicious arrangement of angling, &c., three or four small vessels could be docked at one time, and a definite time fixed for the whole to remain, and not as in some cases vessels are allowed to enter and leave at almost every tide, to the hindrance of those requiring somewhat extensive repairs.

It should be borne in mind that the primary object of a Dock of this description is to give accommodation to first-class steamers trading to and from St. John's, and any vessel of small tonnage in a large Dock would be subject to the little inconvenience of extra lengths of shores, which cannot be avoided.

ADVANTAGES OF CARRYING OUT THE HARBOUR IMPROVEMENTS.

Under the head of "Source of Revenue," we think we have shewn that there can be no question that the Harbor Improvement Works, if carried out in the manner suggested in this Report, would be a great success, and this is seen to be so in whichever way the matter may be viewed. For instance, looking at the undertaking from a Shipowner's point of view, (more particularly as regards the Graving Dock portion of the Works,) we find he would be able to dock his vessel at St. John's at a total cost say of £200 stg., instead of £250, consequently there would be a gain to him of £50 stg. on each vessel, or more

than that according to whether the insurance would run into a second month, as it does occasionally.

The other advantages alluded to, of owners having their vessels repaired immediately under their own supervision, and of knowing and seeing what repairs are necessary, and how they are being executed, are matters of great importance.

It will be seen that in the one case we have shewn the revenue to be derived from the Graving Dock Works by itself, and in the other case we have included the value of the reclaimed land above Job's Bridge, and either way there would be a good return on the money proposed to be invested.

In the event of these Works being carried out, the advantages to the City of St. John's would be very considerable, necessitating, as they would, the employment of a large amount of labor in the repairs of the vessels, and the consequent expenditure of large sums of money in St. John's, which at present go to the Port of Sydney.

Further, we are of opinion that even if these Works were not self-supporting, it would still be to the advantage of the Government to undertake them, as we feel that, indirectly, the Government and the country would be greatly benefited by the steamers belonging to St. John's and others which might seek the use of the Dock for repairs at St. John's. With reference to the revenue of £2,000 per annum, to be derived from the reclamation of the land above Job's

Bridge, and which we have shewn, will probably not be required to contribute to the interest on the Graving Dock Works. We presume this sum, or a portion thereof, as before mentioned, would be kept as a reserve fund for reducing the capital outlay on the Dock, &c., and consequent cost of docking, or if thought desirable, could be made available for future Harbor Improvements.

The construction of such important Works in the Harbor of St. John's will necessarily raise the value of all the wharf property in Water Street.

UTILIZATION OF THE RECLAIMED LAND.

We believe the whole of the North Side of the Harbor of St. John's is now fully occupied by wharves, and in the event of any further accommodation being required, the only place to look for it would be above Job's Bridge, and therefore it would appear to us that this reclaimed land should be utilized and kept available for new wharves, or possibly for the terminus of the proposed Railway across the Island of Newfoundland, rather than laying it out as ornamental grounds.

The Graving Dock Works are so laid out that the present Bridge can be removed and a Swing or Opening Bridge substituted without interfering in any way with the Dock Works; and further, that at any time a Quay Wall could be built immediately in front of the reclaimed land, and the river dredged opposite to such Quay to give a depth of water capable of ac-

commodating vessels of a moderate draft lying alongside.

In fact it becomes a question for consideration whether it would not be better to carry out this scheme and use the dredged materials from the river to fill up the space between the existing and proposed promenade, rather than go to the expense of spending £5,000 in getting material from the hills opposite for the purpose.

Should this proposition be entertained, and we think it should, we would propose a Quay Wall of about 1,000 feet in length with a depth of water alongside, at High Water Ordinary Spring Tides, of from 12 to 13 feet, or 15 feet, if the level of the surface of the Rock below the bed of the River will admit of it; at the same time we would propose to dredge or deepen the Channel-way of the River, for a width of about 200 feet, for the full length of the Quay, and to the same depth of 15 feet below High Water Ordinary Spring Tides. Our data for forming a close estimate of this work is not very exact, but we think the following approximate estimate may be found sufficient :—

Length of Quay Wall, say 1,000 feet	...	£7,500
60,000 cubic yards of dredging in deepening the Channel-way of the River, the dredged materials to be deposited in the space between the existing and the proposed promenade		5,000
Total cost		£12,500

For the expenditure of £12,500 a double purpose is accomplished, for it would provide a Quay, a deep water Channel-way in the River for moderate draft vessels, and sufficient materials for filling up the vacant space between the existing and proposed promenade; whereas by the previous proposition the sum of £5,000 was proposed to be spent in merely filling up the same vacant space.

The cost of the Harbor Improvements under this suggestion, would stand thus:—

Cost of large Dock of full length ...	£103,500
Cost of Quay Wall and deepening the River Channel-way opposite Reclamation Land, and filling in intermediate space between the existing and the proposed promenade with the dredged materials	12,500
Total	£116,000

Cost of large Dock and Reclamation, as previously estimated £110,000

These figures shew, that for an extra expenditure of about £6,000 or £7,000 stg., beyond the former estimate, a Quay could be obtained of about 1,000 feet in length, a dredged Channel-way 200 feet broad for the full length of Quay, and materials for filling up the vacant space between the promenades.

We shall be happy to forward any further information you may require.

We have the honor to be,
Sir,
Your obedient Servants,

KIMPPLE & MORRIS.



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